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Sampling Episode Report Norwegian Star Sampling Episode 6504

Chapter 5 Data Quality

March 2006

5.0 DATA QUALITY

Quality assurance/quality control (QA/QC) procedures applicable to the Star sampling episode are outlined in the *Quality Assurance Project Plan for Rulemaking Support for Large Cruise Ships in Alaska Waters (QAPP)*, which can be found in the Cruise Ship Rulemaking Record and is available upon request. This section describes the quality control practices used to assess the precision and accuracy of the analytical data presented in Section 4.0. Quality control (QC) practices used for this sampling episode include the analysis of matrix spikes, duplicate samples, and quality control standard checks.

5.1 Analytical Quality Control

EPA verified that laboratory performance was acceptable by conducting quality control checks of the analytical data as specified by the QAPP. Data review chemists prepared written data review narratives (Appendix D) describing any qualifications of the analytical data. The following data were not considered to be of acceptable quality for the reasons discussed in Appendix D and were excluded from the data set:

- Fifteen fecal coliform results in samples 65395, 65400, 65403, 65424, 65427, 65444, 65447, 65465, 65467, 65467, 65479, 65485, 65487, 65505, and 65507.
- Six *E. coli* results in samples 65456, 65475, 65476, 65477, 65479, and 65480;
- Five enterococci results in samples 65475, 65476, 65477, 65479, and 65480;

- One dissolved and total sodium result in sample 65411;
- One sulfate result in sample 65547;
- Two organo-phosphorus pesticide results (methamidophos in samples 65395 and 65459); and
- One available cyanide result in sample 65539.

5.1.1 Cyanide Results

There was uncertainty regarding the analytical results for available and total cyanide. Although these data have not been excluded from the database, the results are presented in Table 5-1 and not in the analytical results summary tables in Section 4.1. Available cyanide was detected in many samples, while total cyanide was not detected in these samples. In theory, the total cyanide results for any given sample will be greater than the available cyanide results in the same sample. Because it was not possible to determine which analysis was correct, EPA flagged the irreconcilable results in the database to alert data users to the presence of such problems (see memoranda *Data Review Narrative for Classical Analyses for the Alaska Cruise Ship Industry Episode 6504* and *Issues Associated with Results for Total Cyanide Versus Available Cyanide* in Appendix D for a complete discussion).

EPA did not identify any known source of cyanide onboard the Star during its onboard interviews regarding activities that impact wastewater generation.

5.1.2 Ammonia Results

EPA considers the Star ammonia data (and associated total Kjeldahl nitrogen (TKN) data of which ammonia is a component) to be anomalous because ammonia was not detected in any of the influent to or effluent from treatment system samples. Although these data have not been excluded from the database, the results are presented in Table 5-2 and not in the analytical results summary tables in Section 4.1.

Ammonia is produced within humans when proteins are digested and used by the body, and excess ammonia is excreted in urine. Therefore, ammonia is expected to be present in combined cruise vessel graywater and sewage. In general, 2004 compliance testing data provided by the U.S. Coast Guard (a total of 25 data points) for treated cruise ship wastewater showed ammonia concentrations generally ranging from 4 mg/L to 110 mg/L, with an average concentration 31 mg/L. None of these ammonia concentrations were reported as non-detect.

Furthermore, one of the Alaska Department of Environmental Conservation (ADEC) compliance testing samples was collected during EPA's Star sampling episode. Although the sampling methodology differed (24-hour composite sample for EPA's sample versus grab sample for the compliance sample), the sampling location and analytical test method were the same. EPA's effluent sampling result for ammonia was non-detect (detection limit = 0.05 mg/L), while the compliance sampling result for ammonia was 68 mg/L.

In addition, the TKN results for the Star were unexpectedly low and variable as compared to results from other cruise ships. TKN concentrations in the influent to and effluent from treatment samples collected over five consecutive days, ordered from lowest to highest concentration, for the four sampled ships are shown below.

Ship	TKN Concentrations (mg/L)	
	Influent to Treatment	Effluent from Treatment
Holland America Veendam	60.0, 63.0, 68.0, 80.0, 84.0	11.0, 12.0, 12.0, 28.0, 29.0
Norwegian Star	0.310, 0.760, 3.87, 6.03, 83.7	0.155, 0.760, 0.780, 10.3, 46.3
Island Princess	69.6, 80.2, 84.6, 97.6, 139	27.9, 38.1, 41.1, 42.6, 47.3
Holland America Oosterdam (Graywater/Sewage Treatment System)	182, 192, 192, 197, 200	4.13, 64.0, 68.6, 72.4, 83.2

With the exception of the Star and the Oosterdam, TKN concentrations fall in a relatively narrow range (generally within the same order of magnitude).

In addition, as discussed previously, ADEC compliance testing was conducted during EPA's sampling episode onboard the Star. EPA's effluent sampling result for TKN was

46.3 mg/L, while the compliance sampling result for TKN was 60.3 mg/L. While these results are similar, EPA's result is lower than the ADEC's TKN result.

It is important to note that EPA's review of the ammonia and TKN analytical data for all four sampling episodes did not reveal any obvious errors. The quality control results from each laboratory support the results provided and do not suggest any pervasive problems with the analyses (i.e., matrix spike recoveries and ongoing precision and recovery results were well within the acceptance limits, blanks were free of ammonia at the levels of interest). The Veendam and the Island ammonia and TKN samples were analyzed by a different laboratory than the Star and the Oosterdam ammonia and TKN samples.

EPA considers ammonia and TKN to be critical analytes in characterizing graywater and sewage generation and treatment onboard cruise vessels. Accordingly, EPA believed it was necessary to collect additional ammonia and TKN data to better assess these analytes in cruise ship wastewater. During the 2005 cruise season, EPA conducted a supplementary sampling program to collect samples of the influents to and effluents from the treatment systems onboard the same four ships that were sampled in 2004. Five sets of samples were collected from each ship and analyzed for nitrogen compounds (ammonia, TKN, and nitrate/nitrite). Samples were also analyzed for chemical oxygen demand and total suspended solids to benchmark these classical pollutant concentrations to those measured during the 2004 cruise season. The 2005 sampling activities, including the analytical results, will be described in a separate sampling episode report.

5.1.3 Biochemical and Chemical Oxygen Demand Results

Biochemical oxygen demand (BOD₅) and chemical oxygen demand (COD) are test methods used to measure the content of organic matter in wastewater by determining the amount of oxygen consumed during decomposition of the organic matter. The BOD₅ test method decomposes organic matter using microorganisms, while the COD test method decomposes organic matter using a strong chemical agent in an acidic medium at an elevated temperature. In general, the COD concentration in any given sample should be greater than the BOD₅ concentration for that same sample because more compounds can be chemically oxidized than can

be biologically oxidized. For many wastes, it is possible to develop a correlation between COD and BOD₅.

For the Star sampling episode, BOD₅ concentrations exceeded COD concentrations in galley, food pulper, accommodations, and influent to treatment system samples. Norwegian Cruise Line identified these results as anomalous, indicating that influent to treatment COD concentrations are typically 2 to 2.5 times greater than BOD₅ concentrations and as high as 15 times greater than BOD₅ concentrations.

EPA's review of the BOD₅ and COD data did not reveal any obvious errors. The quality control results from each laboratory support the results provided and do not suggest any pervasive problems with the analyses. Accordingly, there is no way to determine either the reason for these anomalous results or which analysis is correct. EPA has not excluded the BOD₅ and COD results from either the database or the analytical results summary tables in Section 4.1; however, data users should consider limitations of sample results.

5.2 Field Quality Control

The trip blank, equipment blank, and field duplicate results are the field QA/QC measures discussed in this subsection. Section 3.8 of the Star SAP discusses field QC specifications. Tables presented in this section of this document include results for only those analytes detected in the field QC samples during the sampling episode. Appendices A-1 and A-2 contain the results for all analytes, both detected and nondetected.

5.2.1 Trip Blank

A trip blank was collected and analyzed for volatile organics to evaluate possible contamination during shipment and handling of samples. This sample consisted high performance liquid chromatography (HPLC) water. The trip blank was prepared prior to the start of the sampling episode, and accompanied samples shipped to the laboratory on August 13, 2004.

No volatile organics were detected in the trip blank, indicating that there was no contamination of samples during transport, field handling, storage, or shipping. (Note that there is no table with the results of the analyses in this section of the report because all results are nondetects.)

5.2.2 Equipment Blank

The sampling team collected an equipment blank to assess the potential introduction of contaminants by sample collection equipment. The sample collection equipment used to collect the equipment blank was the same as that used at the sampling points: approximately 4 feet of Teflon® tubing connected on one end to a series of metal plumbing fixtures installed on each sample port, and the other end to a small segment of silicone tubing used in the peristaltic pump mechanism of the automatic sampler. The equipment blank was collected by pumping HPLC water through this equipment directly into sample bottles.

Table 5-3 presents the detected results for the equipment blank. Eight total metals and four dissolved metals were detected in the equipment blank. Table 5-3 also includes a value for hardness (a classical analyte), which was calculated based on the total magnesium and calcium concentrations detected in the sample using Standard Method 2340B. In tables presenting the analytical results in Section 4.1, all 12 of these metals analytes hardness are flagged with an “(e)” to indicate they were detected in the equipment blank. EPA will consider the impact of possible contamination from equipment in a future analysis.

5.2.3 Field Duplicates

Field duplicate samples were collected to assess the precision of the entire sample collection, handling, preparation, and analysis process. The relative percent difference (RPD) between the two duplicate sample results is calculated and compared to the data quality objective. For this program, the QAPP provides an RPD target for field duplicate samples as less than 30% for all analytes of a specific analytical method.

Classical Pollutants, Total and Dissolved Metals, and Semivolatile Organics

For classical pollutants, total and dissolved metals, and semivolatile organics, field duplicate samples were samples collected from the same source, at the same time, then stored and analyzed independently. The duplicate samples were collected as split samples poured from the same mixed sample composite jars to minimize sample wastestream variability. Duplicate samples for these analytes were collected from the effluent from the wastewater treatment system (SP-7/8). Note that duplicate samples for dioxins and furans and pesticide analytes were collected during a previous sampling episode, and duplicate samples for HEM/SGT-HEM were not planned for this sampling program.

Table 5-4 presents analytical results and the RPDs for these duplicate samples and includes analytical results for only those analytes that were detected at least once in wastewater samples (i.e., graywater sources, influent to treatment system, or effluent from treatment system) during the sampling episode.

There was excellent precision in sampling and analysis for this sampling episode. Of the 180 duplicate pairs listed in Table 5-4, 165 either achieved the RPD target, or the RPD could not be calculated because both of the duplicate samples were less than the detection limit. The RPD could not be calculated for 7 of the duplicate pairs because the analyte was detected in one sample but not the other. Analytical variability increases as analyte concentrations approach their detection limits. The eight duplicate pairs with an RPD outside of the target (i.e., $\geq 30\%$ difference) include one of three duplicate pairs for each of chemical oxygen demand, nitrate/nitrite, total Kjeldahl nitrogen, total aluminum, total boron, total chromium, total iron, and phenol. These results are not uncommon in complex wastewater samples.

In tables presenting the analytical results in Section 4.1, duplicate sample results are presented as averages (calculation uses detection limits for nondetected results).

Pathogen Indicators and Volatile Organics

For pathogen indicators and volatile organics, field duplicate samples were collected sequentially and not as split samples as was done for the other analytes. For these samples, this methodology introduced sample wastestream variability into the assessment of the precision of sample collection and analysis. Duplicate samples for these analytes were collected from the effluent from the treatment system (SP-7/8). Table 5-5 presents analytical results and the RPDs for these duplicate samples. RPDs could not be calculated for any of the 33 duplicate sample pairs listed in Table 5-5 because both of the duplicate samples were less than the detection limit.

In tables presenting the analytical results in Section 4.1, duplicate sample results are presented as averages (calculation uses detection limits for nondetected results). In the case of pathogen indicators, average daily results presented incorporate both duplicate grab samples and multiple grab samples collected for individual analysis during each 24-hour sampling period. First, duplicate results, where applicable, were averaged to determine the average individual grab sample results for that sample (e.g., grab 1 duplicate sample results for Day 3 were averaged together to represent the average grab 1 sample result for Day 3). Next, the individual grab sample results for each day were averaged to calculate the average daily pathogen indicators results presented in the tables (e.g., grab sample results 1 through 3 for Day 3 were averaged together to calculate the average Day 3 pathogen indicators sample results). In this way, the average daily pathogen indicators results presented in the tables are weighted equally by time of day, rather than weighted more heavily by the particular time of day when duplicate grab samples were collected.

Table 5-1**Available and Total Cyanide Analytical Results, Norwegian Star**

Available and total cyanide analytical results are irreconcilable; see Section 5.1.1

Waste Stream	Available Cyanide (ug/L)	Total Cyanide (mg/L)
Galley (SP-1), Day 1	5.64	ND(0.00500)
Galley (SP-1), Day 2	22.4	ND(0.00500)
Galley (SP-1), Day 3	ND(2.00)	ND(0.00500)
Galley (SP-1), Day 4	ND(2.00)	ND(0.00500)
Galley (SP-1), Day 5	2.03	ND(0.00500)
Food Pulper (SP-2)	35.7	0.00600
Accommodations (SP-3), Day 1	ND(2.00)	ND(0.00500)
Accommodations (SP-3), Day 2	ND(2.00)	ND(0.00500)
Accommodations (SP-3), Day 3	ND(2.00)	ND(0.00500)
Accommodations (SP-3), Day 4	ND(2.00)	ND(0.00500)
Accommodations (SP-3), Day 5	ND(2.00)	ND(0.00500)
Laundry (SP-4), Day 1	ND(2.00)	ND(0.00500)
Laundry (SP-4), Day 2	ND(2.00)	ND(0.00500)
Laundry (SP-4), Day 3	ND(2.00)	ND(0.00500)
Laundry (SP-4), Day 4	ND(2.00)	ND(0.00500)
Laundry (SP-4), Day 5	2.39	ND(0.00500)
Influent to Treatment (SP-5), Day 1	26.9	ND(0.00500)
Influent to Treatment (SP-5), Day 2	29.0	ND(0.00500)
Influent to Treatment (SP-5), Day 3	11.7	ND(0.00500)
Influent to Treatment (SP-5), Day 4	11.5	ND(0.00500)
Influent to Treatment (SP-5), Day 5	11.6	ND(0.00500)
Effluent from Treatment (SP-7), Day 1	ND(2.00)	ND(0.00500)
Effluent from Treatment (SP-7), Day 2	ND(2.00)	ND(0.00500)
Effluent from Treatment (SP-7), Day 3	ND(2.00)	< 0.00800
Effluent from Treatment (SP-7), Day 4	ND(2.00)	ND(0.00500)
Effluent from Treatment (SP-7), Day 5	ND(2.00)	ND(0.00500)
Dried Wastewater Treatment Sludge (SP-9), Day 1	NC	EXCLUDE
Source Water (SP-11), Day 4	ND(2.00)	ND(0.00500)

EXCLUDE - Data excluded from the data set (see data review narratives in Appendix D for details).

NC - Not collected.

ND - Not detected (number in parenthesis is detection limit).

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-2**Ammonia as Nitrogen and Total Kjeldahl Nitrogen Analytical Results, Norwegian Star**

Ammonia and total Kjeldahl nitrogen analytical results are anomalous; see Section 5.1.2.

Waste Stream	Ammonia As Nitrogen (NH₃-N)	Total Kjeldahl Nitrogen (TKN)
Galley (SP-1), Day 1	0.210 mg/L	9.60 mg/L
Galley (SP-1), Day 2	ND(0.0500) mg/L	37.2 mg/L
Galley (SP-1), Day 3	ND(0.0500) mg/L	51.2 mg/L
Galley (SP-1), Day 4	ND(0.0500) mg/L	37.9 mg/L mg/L
Galley (SP-1), Day 5	0.170 mg/L	5.16 mg/L
Food Pulper (SP-2)	ND(0.0500) mg/L	124 mg/L
Accommodations (SP-3), Day 1	ND(0.0500) mg/L	7.13 mg/L
Accommodations (SP-3), Day 2	ND(0.0500) mg/L	8.84 mg/L
Accommodations (SP-3), Day 3	ND(0.0500) mg/L	11.8 mg/L
Accommodations (SP-3), Day 4	ND(0.0500) mg/L	0.930 mg/L
Accommodations (SP-3), Day 5	ND(0.0500) mg/L	11.4 mg/L
Laundry (SP-4), Day 1	ND(0.0500) mg/L	0.560 mg/L
Laundry (SP-4), Day 2	ND(0.0500) mg/L	0.670 mg/L
Laundry (SP-4), Day 3	ND(0.0500) mg/L	2.55 mg/L
Laundry (SP-4), Day 4	ND(0.0500) mg/L	2.64 mg/L
Laundry (SP-4), Day 5	ND(0.0500) mg/L	0.560 mg/L
Influent to Treatment (SP-5), Day 1	ND(0.0500) mg/L	3.87 mg/L
Influent to Treatment (SP-5), Day 2	ND(0.0500) mg/L	0.760 mg/L
Influent to Treatment (SP-5), Day 3	ND(0.0500) mg/L	83.7 mg/L
Influent to Treatment (SP-5), Day 4	ND(0.0500) mg/L	6.03 mg/L
Influent to Treatment (SP-5), Day 5	ND(0.0500) mg/L	0.310 mg/L
Effluent from Treatment (SP-7), Day 1	ND(0.0500) mg/L	0.780 mg/L
Effluent from Treatment (SP-7), Day 2	ND(0.0500) mg/L	0.760 mg/L
Effluent from Treatment (SP-7), Day 3	ND(0.0500) mg/L	46.3 mg/L
Effluent from Treatment (SP-7), Day 4	ND(0.0500) mg/L	0.155 mg/L
Effluent from Treatment (SP-7), Day 5	ND(0.0500) mg/L	10.3 mg/L
Dried Wastewater Treatment Sludge (SP-9), Day 1	3,480 mg/kg	3,550 mg/kg
Source Water (SP-11), Day 4	ND (0.0500) mg/L	0.660 mg/L

ND - Not detected (number in parenthesis is detection limit).

Table 5-3**Equipment Blank Analytical Results, Norwegian Star**

Analytical results for analytes detected in the equipment blank. See Appendix A-2 for all analytical results (detected and nondetected). The equipment blank was collected as a one-time grab sample. Priority pollutants (designated by EPA in 40 CFR Part 423, Appendix A) are identified where applicable.

Analyte	Unit	Priority Pollutant Code	Equipment Blank (SP-11)
Classical Pollutants			
Hardness	mg/L		0.100
Total and Dissolved Metals			
Barium, Total	ug/L		24.8
Copper, Total	ug/L	P120	9.61
Iron, Total	ug/L		82.5
Lead, Total	ug/L	P122	96.5
Manganese, Total	ug/L		4.48
Nickel, Total	ug/L	P124	0.410
Tin, Total	ug/L		0.960
Zinc, Total	ug/L	P128	48.9
Barium, Dissolved	ug/L		0.520
Boron, Dissolved	ug/L		23.1
Manganese, Dissolved	ug/L		1.38
Zinc, Dissolved	ug/L	P128	5.25

Table 5-4

Field Duplicate Analytical Results for Classical Pollutants, Total and Dissolved Metals, and Semivolatile Organics, Norwegian Star

Field duplicate analytical results for classical pollutants, total and dissolved metals, and semivolatile organics, detected at least once in wastewater samples during the sampling episode. See Appendix A-2 for all field duplicate analytical results (detected and nondetected). Field duplicate samples for these analytes are split samples collected from the same source, at the same time, stored and analyzed independently. See Figure 2-2 for the sampling point locations. Also listed are the average result and relative percent difference calculated for each duplicate pair. Priority pollutants (designated by EPA in 40 CFR Part 423, Appendix A) are identified where applicable.

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Classical Pollutants								
Alkalinity	mg/L		65503	65527	63.0	63.0	63.0	0.0
Alkalinity	mg/L		65507	65531	63.0	65.0	64.0	3.1
Alkalinity	mg/L		65511	65535	65.0	65.0	65.0	0.0
Ammonia As Nitrogen (NH3-N)	mg/L		65503	65527	ND (0.050)	ND (0.050)	ND (0.050)	NC
Ammonia As Nitrogen (NH3-N)	mg/L		65507	65531	ND (0.050)	ND (0.050)	ND (0.050)	NC
Ammonia As Nitrogen (NH3-N)	mg/L		65511	65535	ND (0.050)	ND (0.050)	ND (0.050)	NC
Available Cyanide	ug/L	P121	65495	65519	ND (2.00)	ND (2.00)	ND (2.00)	NC
Available Cyanide	ug/L	P121	65499	65523	ND (2.00)	ND (2.00)	ND (2.00)	NC
Available Cyanide	ug/L	P121	65503	65527	ND (2.00)	ND (2.00)	ND (2.00)	NC
Biochemical Oxygen Demand (BOD ₅) (s)	mg/L		65495	65519	8.26	7.32	7.79	12
Biochemical Oxygen Demand (BOD ₅) (s)	mg/L		65499	65523	4.67	5.16	4.92	10
Biochemical Oxygen Demand (BOD ₅) (s)	mg/L		65511	65535	5.25	6.97	6.11	28

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Chemical Oxygen Demand (COD)	mg/L		65503	65527	30.0	52.0	41.0	54
Chemical Oxygen Demand (COD)	mg/L		65507	65531	25.0	24.0	24.5	4.1
Chemical Oxygen Demand (COD)	mg/L		65511	65535	28.0	28.0	28.0	0.0
Chloride (s)	mg/L		65503	65527	205	205	205	0.0
Chloride (s)	mg/L		65507	65531	175	185	180	5.6
Chloride (s)	mg/L		65511	65535	175	195	185	11
Hardness (e) (s)	mg/L		65495	65519	34.9	32.8	33.9	6.2
Hardness (e) (s)	mg/L		65499	65523	56.9	56.1	56.5	1.4
Hardness (e) (s)	mg/L		65507	65531	41.8	42.3	42.1	1.2
Nitrate/Nitrite (NO ₂ -N + NO ₃ -N) (s)	mg/L		65503	65527	0.0890	0.0800	0.0845	11
Nitrate/Nitrite (NO ₂ -N + NO ₃ -N) (s)	mg/L		65507	65531	0.860	0.0960	0.478	160
Nitrate/Nitrite (NO ₂ -N + NO ₃ -N) (s)	mg/L		65511	65535	ND (0.010)	0.0370	< 0.0235	NC
Settleable Residue	mL/L		65495	65519	ND (0.110)	ND (0.120)	ND (0.115)	NC
Settleable Residue	mL/L		65499	65523	ND (0.110)	ND (0.110)	ND (0.110)	NC
Settleable Residue	mL/L		65511	65535	ND (0.100)	ND (0.100)	ND (0.100)	NC
Sulfate	mg/L		65503	65527	41.4	41.9	41.7	1.2
Sulfate	mg/L		65507	65531	11.4	13.0	12.2	13
Sulfate	mg/L		65511	65535	10.2	8.07	9.14	23
Total Cyanide	mg/L	P121	65495	65519	ND (0.005)	ND (0.005)	ND (0.005)	NC
Total Cyanide	mg/L	P121	65499	65523	ND (0.005)	ND (0.005)	ND (0.005)	NC
Total Cyanide	mg/L	P121	65503	65527	0.0110	ND (0.005)	< 0.00800	NC
Total Dissolved Solids (TDS) (s)	mg/L		65503	65527	327	325	326	0.61

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Total Dissolved Solids (TDS) (s)	mg/L		65507	65531	362	336	349	7.4
Total Dissolved Solids (TDS) (s)	mg/L		65511	65535	376	388	382	3.1
Total Kjeldahl Nitrogen (TKN) (s)	mg/L		65503	65527	39.9	52.6	46.3	27
Total Kjeldahl Nitrogen (TKN) (s)	mg/L		65507	65531	0.140	0.170	0.155	19
Total Kjeldahl Nitrogen (TKN) (s)	mg/L		65511	65535	0.160	20.4	10.3	200
Total Organic Carbon (TOC)	mg/L		65503	65527	12.0	12.0	12.0	0.0
Total Organic Carbon (TOC)	mg/L		65507	65531	11.1	11.1	11.1	0.0
Total Organic Carbon (TOC)	mg/L		65511	65535	12.8	12.4	12.6	3.2
Total Phosphorus	mg/L		65503	65527	0.710	0.820	0.765	14
Total Phosphorus	mg/L		65507	65531	0.130	0.100	0.115	26
Total Phosphorus	mg/L		65511	65535	0.140	0.140	0.140	0.0
Total Suspended Solids (TSS)	mg/L		65503	65527	ND (5.00)	ND (5.00)	ND (5.00)	NC
Total Suspended Solids (TSS)	mg/L		65507	65531	ND (5.00)	ND (5.00)	ND (5.00)	NC
Total Suspended Solids (TSS)	mg/L		65511	65535	ND (5.00)	6.00	< 5.50	NC
Total and Dissolved Metals								
Aluminum, Total	ug/L		65495	65519	707	470	589	40
Aluminum, Total	ug/L		65499	65523	255	242	249	5.2
Aluminum, Total	ug/L		65507	65531	291	272	282	6.7
Aluminum, Dissolved	ug/L		65499	65523	ND (8.80)	ND (8.80)	ND (8.80)	NC
Aluminum, Dissolved	ug/L		65507	65531	ND (8.80)	10.6	< 9.70	NC
Antimony, Total	ug/L	P114	65495	65519	ND (2.00)	ND (2.00)	ND (2.00)	NC
Antimony, Total, Total	ug/L	P114	65499	65523	ND (2.00)	ND (2.00)	ND (2.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Antimony, Total	ug/L	P114	65507	65531	ND (2.00)	ND (2.00)	ND (2.00)	NC
Antimony, Dissolved	ug/L	P114	65499	65523	ND (2.00)	ND (2.00)	ND (2.00)	NC
Antimony, Dissolved	ug/L	P114	65507	65531	ND (2.00)	ND (2.00)	ND (2.00)	NC
Arsenic, Total	ug/L	P115	65495	65519	ND (2.00)	ND (2.00)	ND (2.00)	NC
Arsenic, Total	ug/L	P115	65499	65523	ND (2.00)	ND (2.00)	ND (2.00)	NC
Arsenic, Total	ug/L	P115	65507	65531	ND (2.00)	ND (2.00)	ND (2.00)	NC
Arsenic, Dissolved	ug/L	P115	65499	65523	ND (2.00)	ND (2.00)	ND (2.00)	NC
Arsenic, Dissolved	ug/L	P115	65507	65531	ND (2.00)	ND (2.00)	ND (2.00)	NC
Barium, Total (e) (s)	ug/L		65495	65519	4.54	4.01	4.28	12
Barium, Total (e) (s)	ug/L		65499	65523	5.76	5.81	5.79	0.86
Barium, Total (e) (s)	ug/L		65507	65531	4.91	5.03	4.97	2.4
Barium, Dissolved (e) (s)	ug/L		65499	65523	5.06	4.91	4.99	3.0
Barium, Dissolved (e) (s)	ug/L		65507	65531	4.92	4.95	4.94	0.61
Beryllium , Total	ug/L	P117	65495	65519	ND (0.070)	ND (0.070)	ND (0.070)	NC
Beryllium, Total	ug/L	P117	65499	65523	ND (0.070)	ND (0.070)	ND (0.070)	NC
Beryllium, Total	ug/L	P117	65507	65531	ND (0.070)	ND (0.070)	ND (0.070)	NC
Boron, Total	ug/L		65495	65519	245	222	234	9.9
Boron, Total	ug/L		65499	65523	223	164	194	30
Boron, Total	ug/L		65507	65531	321	318	320	0.94
Boron, Dissolved (e)	ug/L		65499	65523	158	138	148	14
Boron, Dissolved (e)	ug/L		65507	65531	350	368	359	5.0
Cadmium, Total	ug/L	P118	65495	65519	ND (0.080)	ND (0.080)	ND (0.080)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Cadmium, Total	ug/L	P118	65499	65523	ND (0.080)	ND (0.080)	ND (0.080)	NC
Cadmium, Total	ug/L	P118	65507	65531	ND (0.080)	ND (0.080)	ND (0.080)	NC
Cadmium, Dissolved	ug/L	P118	65499	65523	ND (0.080)	ND (0.080)	ND (0.080)	NC
Cadmium, Dissolved	ug/L	P118	65507	65531	ND (0.080)	ND (0.080)	ND (0.080)	NC
Calcium, Total (s)	ug/L		65495	65519	8,620	8,080	8,350	6.5
Calcium, Total (s)	ug/L		65499	65523	9,120	9,100	9,110	0.22
Calcium, Total (s)	ug/L		65507	65531	9,980	10,100	10,000	1.2
Calcium, Dissolved (s)	ug/L		65499	65523	8,780	8,330	8,560	5.3
Calcium, Dissolved (s)	ug/L		65507	65531	10,000	9,880	9,940	1.2
Chromium, Total	ug/L	P119	65495	65519	0.440	0.720	0.580	48
Chromium, Total	ug/L	P119	65499	65523	ND (0.270)	ND (0.270)	ND (0.270)	NC
Chromium, Total	ug/L	P119	65507	65531	ND (0.270)	ND (0.27)	ND (0.270)	NC
Chromium, Dissolved	ug/L	P119	65499	65523	ND (0.270)	ND (0.270)	ND (0.270)	NC
Chromium, Dissolved	ug/L	P119	65507	65531	ND (0.270)	ND (0.270)	ND (0.270)	NC
Cobalt, Total	ug/L		65495	65519	ND (0.660)	ND (0.660)	ND (0.660)	NC
Cobalt, Total	ug/L		65499	65523	ND (0.660)	ND (0.660)	ND (0.660)	NC
Cobalt, Total	ug/L		65507	65531	ND (0.660)	ND (0.660)	ND (0.660)	NC
Cobalt, Dissolved (s)	ug/L		65499	65523	2.44	ND (0.660)	< 1.55	NC
Cobalt, Dissolved (s)	ug/L		65507	65531	2.40	ND (0.660)	< 1.53	NC
Copper, Total (e) (s)	ug/L	P120	65495	65519	12.8	9.80	11.3	27
Copper, Total (e) (s)	ug/L	P120	65499	65523	7.99	8.33	8.16	4.2
Copper, Total (e) (s)	ug/L	P120	65507	65531	8.33	8.16	8.25	2.1

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Copper, Dissolved (s)	ug/L	P120	65499	65523	5.57	5.38	5.48	3.5
Copper, Dissolved (s)	ug/L	P120	65507	65531	5.27	5.62	5.45	6.4
Iron, Total (e) (s)	ug/L		65495	65519	459	327	393	34
Iron, Total (e) (s)	ug/L		65499	65523	305	305	305	0.0
Iron, Total (e) (s)	ug/L		65507	65531	288	304	296	5.4
Iron, Dissolved	ug/L		65499	65523	ND (9.80)	ND (9.80)	ND (9.80)	NC
Iron, Dissolved	ug/L		65507	65531	29.3	24.3	26.8	19
Lead, Total (e)	ug/L	P122	65495	65519	1.93	1.74	1.84	10
Lead, Total (e)	ug/L	P122	65499	65523	1.47	ND (0.620)	< 1.05	NC
Lead, Total (e)	ug/L	P122	65507	65531	ND (0.620)	ND (0.620)	ND (0.620)	NC
Lead, Dissolved	ug/L	P122	65499	65523	ND (0.620)	ND (0.620)	ND (0.620)	NC
Lead, Dissolved	ug/L	P122	65507	65531	ND (0.620)	ND (0.620)	ND (0.620)	NC
Magnesium, Total (s)	ug/L		65495	65519	3,260	3,060	3,160	6.3
Magnesium, Total (s)	ug/L		65499	65523	8,280	8,110	8,200	2.1
Magnesium, Total (s)	ug/L		65507	65531	4,100	4,150	4,130	1.2
Magnesium, Dissolved (s)	ug/L		65499	65523	8,090	7,710	7,900	4.8
Magnesium, Dissolved (s)	ug/L		65507	65531	4,160	4,110	4,140	1.2
Manganese, Total (e) (s)	ug/L		65495	65519	18.8	17.3	18.1	8.3
Manganese, Total (e) (s)	ug/L		65499	65523	20.1	20.2	20.2	0.50
Manganese, Total (e) (s)	ug/L		65507	65531	16.9	17.1	17.0	1.2
Manganese, Dissolved (e) (s)	ug/L		65499	65523	22.7	18.4	20.6	21
Manganese, Dissolved (e) (s)	ug/L		65507	65531	20.1	17.0	18.6	17

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Mercury, Total	ug/L	P123	65495	65519	ND (0.050)	ND (0.050)	ND (0.050)	NC
Mercury, Total	ug/L	P123	65499	65523	ND (0.050)	ND (0.050)	ND (0.050)	NC
Mercury, Total	ug/L	P123	65507	65531	ND (0.050)	ND (0.050)	ND (0.050)	NC
Molybdenum, Total	ug/L		65495	65519	ND (1.60)	ND (1.60)	ND (1.60)	NC
Molybdenum, Total	ug/L		65499	65523	ND (1.60)	ND (1.60)	ND (1.60)	NC
Molybdenum, Total	ug/L		65507	65531	ND (1.60)	ND (1.60)	ND (1.60)	NC
Molybdenum, Dissolved	ug/L		65499	65523	ND (1.60)	ND (1.60)	ND (1.60)	NC
Molybdenum, Dissolved	ug/L		65507	65531	ND (1.60)	ND (1.60)	ND (1.60)	NC
Nickel, Total (e) (s)	ug/L	P124	65495	65519	17.8	17.1	17.5	4.0
Nickel, Total (e) (s)	ug/L	P124	65499	65523	12.6	13.5	13.1	6.9
Nickel, Total(e) (s)	ug/L	P124	65507	65531	8.58	8.93	8.76	4.0
Nickel, Dissolved (s)	ug/L	P124	65499	65523	12.2	11.2	11.7	8.5
Nickel, Dissolved (s)	ug/L	P124	65507	65531	8.71	8.33	8.52	4.5
Selenium, Total	ug/L	P125	65495	65519	ND (1.40)	ND (1.40)	ND (1.40)	NC
Selenium, Total	ug/L	P125	65499	65523	ND (1.40)	ND (1.40)	ND (1.40)	NC
Selenium, Total	ug/L	P125	65507	65531	ND (1.40)	ND (1.40)	ND (1.40)	NC
Selenium, Dissolved	ug/L	P125	65499	65523	ND (1.40)	ND (1.40)	ND (1.40)	NC
Selenium, Dissolved	ug/L	P125	65507	65531	ND (1.40)	ND (1.40)	ND (1.40)	NC
Silver, Total	ug/L	P126	65495	65519	ND (0.770)	ND (0.770)	ND (0.770)	NC
Silver, Total	ug/L	P126	65499	65523	ND (0.770)	ND (0.770)	ND (0.770)	NC
Silver, Total	ug/L	P126	65507	65531	ND (0.770)	ND (0.770)	ND (0.770)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Sodium, Total (s)	ug/L		65495	65519	66,500	61,100	63,800	8.5
Sodium, Total (s)	ug/L		65499	65523	102,000	97,800	99,900	4.2
Sodium, Total (s)	ug/L		65507	65531	68,400	68,700	68,600	0.44
Sodium, Dissolved (s)	ug/L		65499	65523	95,500	90,600	93,100	5.3
Sodium, Dissolved (s)	ug/L		65507	65531	62,200	61,500	61,900	1.1
Thallium, Total	ug/L	P127	65495	65519	ND (0.800)	ND (0.800)	ND (0.800)	NC
Thallium, Total	ug/L	P127	65499	65523	ND (0.800)	ND (0.800)	ND (0.800)	NC
Thallium, Total	ug/L	P127	65507	65531	ND (0.800)	ND (0.800)	ND (0.800)	NC
Tin, Total (e)	ug/L		65495	65519	ND (0.940)	ND (0.940)	ND (0.940)	NC
Tin, Total (e)	ug/L		65499	65523	ND (0.940)	ND (0.940)	ND (0.940)	NC
Tin, Total (e)	ug/L		65507	65531	ND (0.940)	ND (0.940)	ND (0.940)	NC
Tin, Dissolved	ug/L		65499	65523	ND (0.940)	ND (0.940)	ND (0.940)	NC
Tin, Dissolved	ug/L		65507	65531	ND (0.940)	ND (0.940)	ND (0.940)	NC
Titanium, Total	ug/L		65495	65519	ND (0.620)	ND (0.620)	ND (0.620)	NC
Titanium, Total	ug/L		65499	65523	ND (0.620)	ND (0.620)	ND (0.620)	NC
Titanium, Total	ug/L		65507	65531	ND (0.620)	ND (0.620)	ND (0.620)	NC
Vanadium, Total	ug/L		65495	65519	ND (0.470)	ND (0.470)	ND (0.470)	NC
Vanadium, Total	ug/L		65499	65523	ND (0.470)	ND (0.470)	ND (0.470)	NC
Vanadium, Total	ug/L		65507	65531	ND (0.470)	ND (0.470)	ND (0.470)	NC
Vanadium, Dissolved	ug/L		65499	65523	ND (0.470)	ND (0.470)	ND (0.470)	NC
Vanadium, Dissolved	ug/L		65507	65531	ND (0.470)	ND (0.470)	ND (0.470)	NC

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-4 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original Effluent from Treatment (SP-7) (b)	Duplicate Effluent from Treatment (SP-8) (b)	Average	Relative Percent Difference
Yttrium, Total	ug/L		65495	65519	ND (0.310)	ND (0.310)	ND (0.310)	NC
Yttrium, Total	ug/L		65499	65523	ND (0.310)	ND (0.310)	ND (0.310)	NC
Yttrium, Total	ug/L		65507	65531	ND (0.310)	ND (0.310)	ND (0.310)	NC
Zinc, Total (e) (s)	ug/L	P128	65495	65519	597	555	576	7.3
Zinc, Total (e) (s)	ug/L	P128	65499	65523	744	749	747	0.67
Zinc, Total (e) (s)	ug/L	P128	65507	65531	633	643	638	1.6
Zinc, Dissolved (e)	ug/L	P128	65499	65523	667	631	649	5.5
Zinc, Dissolved (e)	ug/L	P128	65507	65531	619	608	614	1.8
Semivolatile Organics								
Bis(2-ethylhexyl)phthalate	ug/L	P066	65495	65519	ND (10.0)	ND (10.0)	ND (10.0)	NC
Bis(2-ethylhexyl)phthalate	ug/L	P066	65499	65523	ND (10.0)	ND (10.0)	ND (10.0)	NC
Bis(2-ethylhexyl)phthalate	ug/L	P066	65503	65527	ND (10.0)	ND (10.0)	ND (10.0)	NC
Diethyl Phthalate	ug/L	P070	65495	65519	ND (10.0)	ND (10.0)	ND (10.0)	NC
Diethyl Phthalate	ug/L	P070	65499	65523	ND (10.0)	ND (10.0)	ND (10.0)	NC
Diethyl Phthalate	ug/L	P070	65503	65527	ND (10.0)	ND (10.0)	ND (10.0)	NC
Phenol (s)	ug/L	P065	65495	65519	66.0	57.0	61.5	15
Phenol (s)	ug/L	P065	65499	65523	32.0	62.0	47.0	64
Phenol (s)	ug/L	P065	65503	65527	65.0	69.0	67.0	6.0

(a) Sample numbers identify corresponding analytical results in Appendix A-2.

(b) Sampling point location; see Figure 2-2.

(e) Analyte detected at some level in the equipment blank. See Section 5.2.2 and Table 5-3 for equipment blank results.

(s) Analyte detected at some level in the source water. See Section 4.1.7 and Table 4-12 for source water results.

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

< - Average result includes at least one nondetect value (calculation uses detection limits for nondetected results).

Table 5-5

Field Duplicate Analytical Results for Pathogen Indicators and Volatile Organics, Norwegian Star

Field duplicate analytical results presented for pathogen indicators and volatile organics detected at least once during the sampling episode. Field duplicate samples were collected sequentially from the same source, stored, and analyzed independently. See Figure 2-2 for sampling point locations. Also listed are average result and relative percent difference calculated for each duplicate pair. Priority pollutants (designated by EPA in 40 CFR Part 423, Appendix A) are identified where applicable.

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original (b) Effluent from Treatment (SP-7)	Duplicate (b) Effluent from Treatment (SP-8)	Average	Relative Percent Difference
Pathogen Indicators								
<i>E. coli</i>	MPN/100 mL		65496	65558	ND (1.00)	ND (1.00)	ND (1.00)	NC
<i>E. coli</i>	MPN/100 mL		65500	65559	ND (1.00)	ND (1.00)	ND (1.00)	NC
<i>E. coli</i>	MPN/100 mL		65508	65560	ND (1.00)	ND (1.00)	ND (1.00)	NC
<i>E. coli</i>	MPN/100 mL		65495	65519	ND (1.00)	ND (1.00)	ND (1.00)	NC
<i>E. coli</i>	MPN/100 mL		65499	65523	ND (1.00)	ND (1.00)	ND (1.00)	NC
<i>E. coli</i>	MPN/100 mL		65503	65527	ND (1.00)	ND (1.00)	ND (1.00)	NC
<i>E. coli</i>	MPN/100 mL		65507	65531	ND (1.00)	ND (1.00)	ND (1.00)	NC
Enterococci	MPN/100 mL		65496	65558	ND (1.00)	ND (1.00)	ND (1.00)	NC
Enterococci	MPN/100 mL		65500	65559	ND (1.00)	ND (1.00)	ND (1.00)	NC
Enterococci	MPN/100 mL		65508	65560	ND (1.00)	ND (1.00)	ND (1.00)	NC
Enterococci	MPN/100 mL		65495	65519	ND (1.00)	ND (1.00)	ND (1.00)	NC
Enterococci	MPN/100 mL		65499	65523	ND (1.00)	ND (1.00)	ND (1.00)	NC
Enterococci	MPN/100 mL		65503	65527	ND (1.00)	ND (1.00)	ND (1.00)	NC
Enterococci	MPN/100 mL		65507	65531	ND (1.00)	ND (1.00)	ND (1.00)	NC
Fecal Coliform	CFU/100 mL		65496	65558	ND (2.00)	ND (2.00)	ND (2.00)	NC
Fecal Coliform	CFU/100 mL		65500	65559	ND (2.00)	ND (2.00)	ND (2.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendices A-1 and A-2.

(b) Sampling point location; see Figure 2-2.

EXCLUDE - Data excluded from the data set (see data review narratives in Appendix D for details).

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.

Table 5-5 (Continued)

Analyte	Unit	Priority Pollutant Code	Sample Numbers (a)		Original (b) Effluent from Treatment (SP-7)	Duplicate (b) Effluent from Treatment (SP-8)	Average	Relative Percent Difference
Fecal Coliform	CFU/100 mL		65508	65560	ND (2.00)	ND (2.00)	ND (2.00)	NC
Fecal Coliform	CFU/100 mL		65495	65519	ND (2.00)	ND (2.00)	ND (2.00)	NC
Fecal Coliform	CFU/100 mL		65499	65523	ND (2.00)	ND (2.00)	ND (2.00)	NC
Fecal Coliform	CFU/100 mL		65503	65527	ND (2.00)	ND (2.00)	ND (2.00)	NC
Fecal Coliform	CFU/100 mL		65507	65531	EXCLUDE	ND (2.00)	ND (2.00)	NC
Volatile Organics								
Bromodichloromethane	ug/L	P048	65495	65519	ND (5.00)	ND (5.00)	ND (5.00)	NC
Bromodichloromethane	ug/L	P048	65499	65523	ND (5.00)	ND (5.00)	ND (5.00)	NC
Bromodichloromethane	ug/L	P048	65503	65527	ND (5.00)	ND (5.00)	ND (5.00)	NC
Chloroform	ug/L	P023	65495	65519	ND (5.00)	ND (5.00)	ND (5.00)	NC
Chloroform	ug/L	P023	65499	65523	ND (5.00)	ND (5.00)	ND (5.00)	NC
Chloroform	ug/L	P023	65503	65527	ND (5.00)	ND (5.00)	ND (5.00)	NC
Ethylbenzene	ug/L	P038	65495	65519	ND (5.00)	ND (5.00)	ND (5.00)	NC
Ethylbenzene	ug/L	P038	65499	65523	ND (5.00)	ND (5.00)	ND (5.00)	NC
Ethylbenzene	ug/L	P038	65503	65527	ND (5.00)	ND (5.00)	ND (5.00)	NC
Toluene	ug/L	P086	65495	65519	ND (5.00)	ND (5.00)	ND (5.00)	NC
Toluene	ug/L	P086	65499	65523	ND (5.00)	ND (5.00)	ND (5.00)	NC
Toluene	ug/L	P086	65503	65527	ND (5.00)	ND (5.00)	ND (5.00)	NC

(a) Sample numbers identify corresponding analytical results in Appendices A-1 and A-2.

(b) Sampling point location; see Figure 2-2.

EXCLUDE - Data excluded from the data set (see data review narratives in Appendix D for details).

ND - Not detected (number in parentheses is detection limit).

NC - Not calculated because one or both of the sample results is less than the laboratory detection limit.